What is the relationship between alcohol intake and coronary heart disease?

Conclusion

Strong evidence consistently demonstrates that compared to non-drinkers, individuals who drink moderately have lower risk of coronary heart disease (CHD).

Insufficient evidence was available to determine if drinking patterns were predictive of risk of CHD, although there was moderate evidence to suggest that heavy or binge drinking is detrimental.

Grade: Strong; Insufficient

Overall strength of the available supporting evidence: Strong; Moderate; Limited; Expert Opinion Only; Grade not assignable For additional information regarding how to interpret grades, click here.

Evidence Summary Overview

Related to the association between alcohol consumption and risk of coronary heart disease (CHD), six systematic reviews/meta-analyses were reviewed. This evidence included four methodologically strong meta-analyses (Bagnardi, 2008; Corrao, 2000; Di Castelnuovo, 2002; and Rimm, 1999); one methodologically neutral meta-analysis (Cleophas, 1999) and one systematic review that was methodologically neutral (Britton and McKee, 2000).

Overall, the evidence shows that compared to those who abstain from alcohol, regular light to moderate drinking can reduce the risk of CHD; whereas, heavy irregular or binge drinking increases risk of CHD. In a meta-analysis of 20 observational studies, Bagnardi et al, (2008) found significant differences in the alcohol intake dose response relationship to CHD risk in regular vs. irregular drinkers. These authors concluded that the consumption of alcohol on more than two days per week has a significant protective effect against CHD. Cleophas et al, (1999) found that alcohol consumption at one to four drinks per day reduced risk of mortality and CHD, while more than five drinks per day increased risk of mortality, and wine, beer and spirits were equally beneficial. Interestingly, a meta-analysis conducted by Corrao et al, (2000) of 43 cohort studies, found that in Mediterranean countries, protective effects were seen up to 145 per day, but in all other countries, the protective effects were only seen up to 80grams per day. Di Castelnuovo et al, (2000) compared wine and beer consumption in a meta-analysis of 26 international studies. The relative risks of cardiovascular disease (CVD) were 0.68 (95% CI: 0.59-0.77) and 0.78 (95% CI: 0.70-0.86) for consumption of wine and beer, respectively, relative to non-drinkers. Rimm (1999) concluded that based on a meta-analysis of 42 randomized controlled trials (RCTs), alcohol consumption per se, not other components of alcoholic beverages, was responsible for the lower risk of CHD among moderate drinkers. Furthermore, based on measures of high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) and fibrinogen, to the degree documented in the meta-analysis, consumption of two standard drinks per day would lower a person's risk of CHD by approximately 25%. According to Britton and Mckee (2000) a systematic review of international studies, not only alcohol quantity, but also drinking patterns such as binge drinking, influenced CVD risk.

Collectively, the research suggests that whereas binge drinking (more than three alcoholic drinks every one to two hours) has harmful effects, light to moderate alcohol consumption spread over several days of the week has beneficial effects relative to CVD risk. Therefore, for a given volume of alcohol within a moderate drinking range, it is better to distribute this volume evenly over several days, rather than consuming it in two to three days.

Evidence Summary Paragraphs

Bagnardi et al, 2008 (positive quality) conducted a meta-analysis to evaluate whether drinking pattern, defined by the frequency of drinking days as well as drinking intensity per drinking occasion, modified the effect of alcohol intake on the risk of CHD. A Medline search for articles published between 1966 and 2006 was done using keywords related to disease (coronary heart disease, coronary death, myocardial infarction, ischemic heart disease), exposure (quantity or dose of alcohol intake and pattern of alcohol drinking) and frequency of alcohol drinking (regular, irregular, problem drinking, alcoholic intoxication, heavy episodic drinking, hangover). The final meta-analysis included six studies, four cohort studies and two case-control studies. Compared with those who abstained from alcohol, regular heavy drinkers had a reduced risk of CHD (RR 0.75; 95% CI: 0.64, 0.89) and heavy irregular or binge drinkers had an increased risk (RR 1.10; 95% CI: 1.03, 1.17). The dose-response relationship between the amount of alcohol consumed and CHD risk also differed between regular and irregular heavy drinkers ($P<0.047$). A J-shaped curve was seen for irregular drinkers: The nadir and the last protective dose of 28g per week (RR 0.59; 95% CI: 0.53 to 0.65) and 131g per week (RR 0.85; 95% CI: 0.72 to 0.99) were obtained included drinkers who consumed alcohol for two days a week or less. Conversely, in people who consumed alcohol for more than two days a week a significant protective effect was seen even when drinking high amounts of alcohol.

Britton and McKee, 2000 (neutral quality), presents the key findings of a comprehensive systematic review that examined the relationship between heavy drinking and irregular (binge) drinking and sudden cardiovascular mortality. Six prospective cohort studies, conducted in Europe and the US, were included, as well as a number of case-control studies. The prospective follow-up ranged from 6.7 to 40 years. The authors found considerable evidence that binge drinkers as are at greater risk of cardiac arrhythmias and sudden cardiac death. The evidence also supported a temporal and dose-response relationship for sudden cardiac death and for fatal myocardial infarction (MI). The authors concluded that physiological evidence indicates that a causal relationship is biologically plausible, and that the effects of binge drinking are quite different from those seen with regular moderate and even heavy drinking.

Cleophas, 1999 (neutral quality), a meta-analysis of 20 international studies, assessed the relationship between MI and consumption of different types of alcoholic beverages, both in low doses (one to four drinks per day) and high doses (more than four drinks per day). Eight cohort studies were included that reported on the association between alcohol consumption irrespective of the type of drink and cardiovascular death, as well as twelve prospective cohort studies that reported on the risk of MI and specific types of alcoholic drinks. Small doses of alcohol were associated with a reduced risk of mortality and CHD, while more than five drinks per day increased the risk of mortality; wine, beer and spirits were equally beneficial.

Corrao et al, 2000 (positive quality) conducted a meta-analysis to evaluate the relationship between alcohol consumption and risk of CHD. Searches were conducted using Medline, Current Content, EMBASE, CAB, and Core Biomedical Collection, and a hand search of general reviews and meta-analyses published on issue was performed. The search included studies published between 1966 and 1998, and used the keywords for disease (coronary heart disease, coronary artery disease,

coronary event, coronary death, myocardial infarction, ischemic heart disease and angina pectoris) and alcohol consumption (alcohol or ethanol and consumption, intake and drinking). The final sample included 43 cohort studies, eight case-control studies. Results from all 51 studies showed that a protective effect was evident up to 90g per day (RR=0.94; 95%CI: 0.90, 1.00), with harmful effects evidence at 113g per day (RR=1.08; 95%CI: 1.00, 1.16). These effects were modified when only the high quality studies (N=28) were considered, such that a protective effect was evident up to 72g per day (RR=0.96; 95%CI: 0.92, 1.00), and harmful effects were evident at 89g per day (RR=1.05; 95%CI: 1.00, 1.11). When examining data from females only, a protective effect evident up to 31g per day (RR=0.93; 95%CI: 0.87, 1.00), and harmful effects were evident at 52g per day (RR=1.12; 95%CI: 1.00, 1.26); for males, a protective effect was evident up to 87g per day (RR=0.94; 95%CI: 0.88, 1.00), and harmful effects were evident at 114g per day (RR=1.09; 95%CI: 1.00, 1.19). When looking at Mediterranean countries, protective effects were seen up to 145g per day (RR=0.76; 95%CI: 0.61, 1.00), but in all other countries as a whole, protective effects were only seen up to 80g per day (RR=0.93; 95%CI: 0.87, 1.00).

Di Castelnuovo et al, 2002 (positive quality), a meta-analysis of 26 international studies, studied the relationship between wine or beer consumption and CVD. From 13 studies, the RR of vascular disease associated with wine intake was 0.68 (95% CI: 0.59-0.77) relative to non-drinkers, and 10 studies supported a J-shaped relationship between different amounts of wine intake and vascular risk. A statistically significant inverse relationship was found up to a daily intake of 150ml of wine. From 15 studies, the relative risk of vascular disease associated with moderate beer consumption was 0.78 (95% CI: 0.70-0.86). However, no significant (NS) relationship between different amounts of beer intake and vascular risk was found.

Rimm et al, 1999 (positive quality) a meta-analysis of 42 experimental trials quantitatively examined the association between moderate alcohol intake and CHD risk. All of these trials offered the advantage of being randomized design, but all we relatively small. Trials were weighted according to number of study participants. Consumption of 30g alcohol per day (approximately two standard drinks) increased HDL levels by 4.0mg/dL, which was associated with an adjusted 16.8% decrease in CHD risk. Fibrinogen concentration also decreased by 7.5mg/dL, but the decrease was NS. Conversely, TG levels increased by an estimated 5.7% resulting in a 4.6% increase in CHD risk, which slightly attenuated the alcohol benefit. Taken together, the estimated changes in HDL, TG and fibrinogen levels induced by consumption of 30g of alcohol result in a 24.7% reduction in the risk of CHD.

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Author, Year, Study Design, Class, Rating	Population/Subjects	Significant Outcomes
Bagnardi V, Zatonski et al, 2008 Study Design: Meta-analysis or Systematic Review	N=six studies (four cohort studies, two case-control studies).	Compared with those who abstained from alcohol, regular heavy drinkers had a ↓ risk of CHD (RR 0.75; 95% CI: 0.64, 0.89) and heavy irregular or binge drinkers had an ↑ risk (RR 1.10; 95% CI: 1.03, 1.17).

Class: M Rating: 		Dose-response relationship between amount of alcohol consumed and CHD risk also differed between regular and irregular heavy drinkers (P<0.047). A J-shaped curve seen for irregular drinks: The nadir and the last protective dose of 28g per week (RR 0.59; 95% CI: 0.53 to 0.65) and 131g per week (RR 0.85; 95% CI: 0.72 to 0.99) were obtained included drinks who consumed alcohol for ≤two days a week. For people who consumed alcohol >two days a week, a significant protective effect was seen even when drinking ↑ amounts of alcohol.
Britton A and McKee M, 2000 Study Design: Meta-analysis or Systematic Review Class: M Rating: 	N=six prospective cohort studies with 6.7 to 40 years of follow-up; three selected case-control studies. Subjects were adult males. Location: Europe and the United States.	Considerable evidence from both cohort and case-control studies that binge drinkers are at ↑ risk of cardiac arrhythmias and sudden cardiac death. Physiological and case-control studies provide evidence of a temporal relationship between binge drinking and death. Consistent evidence of a dose-response relationship between binge drinking and sudden cardiac death and for fatal MI. A causal relationship is biologically plausible, and the effects of binge drinking are quite different from those seen with regular moderate, and even heavy drinking.
Cleophas TJ 1999 Study Design: Meta-analysis/Systematic Review Class: M Rating: 	N=20 international studies assessing the relationship between MI and consumption of different types of alcoholic beverages, both in low doses (one to four drinks per day) and high doses (>four drinks per day).	Small doses of alcohol associated with ↓ risk of mortality and CHD, while >five drinks per day ↑ risk of mortality; wine, beer and spirits were equally beneficial.

	Eight cohort studies reported on association between alcohol consumption irrespective of type of drink and cardiovascular death. 12 prospective cohort studies reported on risk of MI and specific types of alcoholic drinks.	
Corrao G, Rubbiati L et al, 2000 Study Design: Meta-analysis or Systematic Review Class: M Rating:	N=43 cohort studies, eight case-control studies.	Results from all 51 studies showed that a protective effect was evident up to 90g per day (RR=0.94; 95%CI: 0.90, 1.00), with harmful effects evidence at 113g per day (RR=1.08; 95%CI: 1.00, 1.16). Effects were modified when only the high quality studies (N=28) were considered, such that a protective effect was evident up to 72g per day (RR=0.96; 95%CI: 0.92, 1.00) and harmful effects were evident at 89g per day (RR=1.05; 95%CI: 1.00, 1.11). For females, protective effect evident up to 31g per day (RR=0.93; 95%CI: 0.87, 1.00) and harmful effects evident at 52g per day (RR=1.12; 95%CI: 1.00, 1.26). For males, protective effect evident up to 87g per day (RR=0.94; 95%CI: 0.88, 1.00) and harmful effects evident at 114g per day (RR=1.09; 95%CI: 1.00, 1.19).
Di Castelnuovo et al 2002 Study Design: Meta-analysis Class: M Rating:	N=26 international studies, studying relationship between wine or beer consumption and CVD.	From 13 studies, the RR of vascular disease associated with wine intake was 0.68 (95% CI: 0.59-0.77) relative to non-drinkers and 10 studies supported a J-shaped relationship between different amounts of wine intake and vascular risk. A statistically significant inverse relationship found up to a daily intake of 150ml of wine.

		From 15 studies, RR of vascular disease associated with moderate beer consumption was 0.78 (95% CI: 0.70-0.86). However, NS relationship between different amounts of beer intake and vascular risk.
Rimm EB, Williams P et al, 1999 Study Design: Meta-analysis or Systematic Review Class: M Rating: 	N=42 randomized trials.	RR for CHD with ethanol (30g per day): HDL: 0.69 (95% CI: 0.47-0.99) per $10mg/d^2$. Fibrinogen: 1.34 (95% CI: 1.15-1.56) per $10mg/d^2$. TG: 1.40 (1.10 to 1.77) per $10mg/d^2$.

Research Design and Implementation Rating Summary
For a summary of the Research Design and Implementation Rating results, click here.

Worksheets

Bagnardi V, Zatonski W, Scotti L, La Vecchia C, and Corrao G. (2008). Does drinking pattern modify the effect of alcohol on the risk of coronary heart disease?: Evidence from a meta-analysis. *Journal of Epidemiology and Community Health*, 2008 62 (7), 615-619.

Britton A, McKee M. The relation between alcohol and cardiovascular disease in Eastern Europe: Explaining the paradox. *J Epidemiol Community Health.* 2000 May; 54 (5): 328-332. Review.

Cleophas TJ. Wine, beer and spirits and the risk of myocardial infarction: a systematic review. *Biomed Pharmacother.* 1999;53(9):417-23.

Corrao G, Rubbiati L, Bagnardi V, Zambon A, Poikolainen, K. Alcohol and coronary heart disease: A meta-analysis. Addiction. 2000; 95: 1,505-1,523.

Di Castelnuovo A, Rotondo S, Iacoviello L, Donati MB, De Gaetano G. Meta-analysis of wine and beer consumption in relation to vascular risk. *Circulation.* 2002 Jun 18;105(24):2836-44.

Rimm EB, Williams P, Fosher K, Criqui M, Stampher MJ. Moderate alcohol intake and lower risk of coronary heart disease: meta-analysis of effects on lipids and haemostatic factors. *BMJ.* 1999; 319: 1523-1528.